



Amendments to the Specification:

Please replace paragraph [0120] with the following amended paragraph:

[0120] The lock includes a housing with a bore disposed through the housing and a plug (or lock core) rotatably mounted within the bore. The plug has a longitudinal axis and a first orifice or passage parallel to the longitudinal axis to provide a keyway that is adapted to receive a key. The ~~plug and housing~~ housing and plug also each include a plurality of paired sets of radially extending apertures or holes, respectively, which are adapted to receive, respectively, the drivers and tumblers of the lock. The radially extending holes in the housing form driver chambers. The radially extending holes in the plug form tumbler chambers. When the lock is in a first position wherein the drivers and tumblers can move in a vertical direction (in the Figure), the vertical apertures of the plug are aligned with the vertical apertures of the housing. In this first lock position or first rotated position, the tumbler chambers are aligned with the respective driver chambers, each resulting pair of extended apertures or holes forms a pin chamber. The drivers and tumblers can move within the aligned set of pin chambers. The lock can also include a change member, for example, a change ball in the form of a ball bearing, that is adapted to be disposed within the pin chamber as part of the paired driver/tumbler stack or set, or alternatively can be disposed within a separate retainer recess or cavity located in or otherwise associated with the plug. This change member can have a size smaller than that of the other members of the driver/tumbler stack or set. By moving a change member or change members between one or more of the pin chambers and the retainer cavities, one may alter the driver/tumbler configuration such that the lock will accept and operate with a second key having a differing top contour, but will not operate with the originally operable first key.

Please replace paragraph [0141] with the following amended paragraph:

[0141] The change slot 88 is preferably configured into the plug 16 along the longitudinal line passing through the centers of the retainer cavities 58. This configuration allows the change tool 64 inserted into the change slot 88 to raise a change ball 56 contained therein at its center of

weight and to its maximum height. Additionally, the change slot 88 is configured to minimize the width thereof to that necessary to accommodate a change tool 64 that can effectively raise the change balls 56 out of the retainer cavities 58. In a typical door lock, having six or so pin chambers, the width of the change slot is typically about 0.020 inches (about 0.50 mm) or less. If the width of the change slot 88 is too large, a member such as a master shim 60 (discussed herein after) might catch the corner 188 of the opening to the retainer cavity 58 at the intersection with the change slot 88 (see ~~FIG. 2~~ FIG. 2A). With time, the repeated impact of the master shim against the corner 188 can cause wear at the corner 188, which could eventually permit a shim to twist and jamb into the opening.

Please replace paragraph [0146] with the following amended paragraph:

[0146] It should be recognized that when the lower portion of a change ball 56, below its centerline, spans the shear line, the rotation along the shear line of the plug within the housing will cause the ball 56 to be forced into the drive chamber 40. If the centerline or the upper portion of the change ball lies along the shear line, the ~~lug~~ plug will not rotate in the bore of the housing, and may become jammed.

Please replace paragraph [0162] with the following amended paragraph:

[0162] A second embodiment of the invention is depicted in FIGS. 16A-22N wherein like numbers designate like components. The second embodiment illustrates the use of a change tool 64 for reconfiguring the drivers 20, tumblers 22, and change balls 56 of the lock 10. This embodiment can expand the number of keys in a particular subset of user keys compared to the first embodiment. Instead of moving additional change balls 56 from the pin chambers 18 into the retainer cavities 58 as one progresses through a subset of user keys, as described in the first embodiment, the second embodiment enables one to move change balls 56 back and forth between the first position in the pin chambers 18 and the second position in the retainer cavities 58. Typically, the movement of change balls 56 to and from the retainer cavities 58 and the pin chambers 18 permits the reconfiguration of the lock to operate with a different user key of the subset of user keys. The movement of the change balls to and from also typically involves, at

some point in the process, a resetting of the lock, wherein all the change members are returned back into their ~~respective the pin chambers~~ respective pin chambers. The lock is in a reset configuration when all the change members 56 are in the pin chambers, with an authorized or an operable user key inserted in the keyway, or with no key inserted. The contour locations 66 used in this second embodiment also prevent the "automatic" change described above for the first embodiment with respect to FIGS. 2A-12B, as explained in greater detail below.

Please replace paragraph [0165] with the following amended paragraph:

[0165] The method of using the lock 10 of this embodiment of the present invention provides a means for rapidly changing the internal configuration of the drivers, tumblers and change members of the lock to reconfigure the lock to operate exclusively with one of many different keys in a set of keys. The method of using the rapid change lock does not require disassembly, or removal of the plug from the housing. The method involves inserting a first key 30a into the longitudinal keyway 24 of a lock 10 that is programmed or configured to operate with the first key 30a. This first key 30a then can be used to rotate the plug 16 within the housing 12. After the plug 16 is rotated one-quarter turn clockwise(that is, about 90.degree. in the illustrated embodiment) to bring the change slot 88 into alignment with the driver chambers 40, the change tool 64 can be inserted into the change slot 88, forcing any change balls 56 disposed in the retainer cavities 58 into the driver chambers 40. With the change tool 64 in the inserted position, the plug 16 is then rotated back one-quarter turn counter-clockwise to its original position. The first key 30a is then removed from the keyway 24. Removal of the first key 30a from the keyway allows the driver springs 26 disposed above the drivers 20 force any change balls 56 from the driver chambers 40 into the tumbler chambers. This resets the lock, or said another way, places the lock into a reset configuration. A second key 62a is then inserted. The second key 62a has a different though complementary top edge contour 32 to the first key 32a; that is, it is otherwise similar to the top edge contour 32 of the first key 30a except that a different two of the contour positions 66 are raised. When key 62a is inserted, at least two change balls 56 are raised above the shear line 38 and are disposed in the driver chambers 40 of the housing 12 as shown in FIGS. 18A and 18B. As the second key 62a and plug 16 are rotated onequarter turn clockwise, the retainer cavities 58 will come into alignment with the driver chambers 40 of the

housing 12. The change tool 64 is then removed from the change slot 88, whereby the driver springs 26 disposed above the drivers 20 force the change balls 56 located above the shear line 38 down into the corresponding retainer cavities 58. As the second key 62a is rotated along with the plug 16 back to its original position (see Fig. 20A and 20B), the disposed change balls 56 remain deposited in the retainer cavities 58, offset from the pin chambers 18, thereby reconfiguring the lock to operate with the second key 62a.

Please replace paragraph [0166] with the following amended paragraph:

[0166] The illustrated second embodiment will now be described in additional detail. ~~The lock~~ In Fig. 16A and 16B, the lock 10 of the second embodiment is depicted with the first key 30a inserted into the keyway 24 and with the first and third change balls 56 disposed in the respective retainer cavities 58. The first key 30a can operate the lock 10 since its insertion causes none of the driver or tumbler members of any of the pin chambers 18 or any of the change balls 56, to span the shear line 38. The first key 30a has a top edge contour 32 having first and third contour locations 68, 72 in a raised position, and with the remaining four contour locations 70, 74, 76, 78, in a lowered position. The Figures show that the lowered contour locations 70, 74, 76, 78 keep the change balls 56 disposed within their respective tumbler chambers 42 when the first key 30a is inserted. The raised first and third contour locations 68, 72 lift the drivers 20 and tumblers 22 such that the lower ends 34 of the drivers 20 are positioned along the shear line 38 with the drivers 20 disposed entirely in the first and third driver chambers 40. The change balls 56 associated with the first and third pin chambers 19, 23 have been displaced into and are disposed in the corresponding retainer cavities 58 in the plug 16.

Please replace paragraph [0170] with the following amended paragraph:

[0170] Figs. 22A-22N show various other keys of the subset of keys that can operate the second embodiment of the lock of the present invention. Each of the keys in Figs. 22A-22N is configured to raise only two of the change balls above the shear line 38 of the lock 10. All of the keys are unique. That is, the keys are configured whereby the any two raised contour locations 66 are staggered, such that no two keys exhibit the same staggered pattern of two raised contour

locations 66. This configuration prevents the lock 10 from being automatically changed without employing a change tool 64, as is the case with the first embodiment of the lock 10. It can be recognized that a key will not operate in a lock 10 when a lowered contour location 66 is present on the key in a position corresponding to a pin chamber 18 in which a change ball 56 has been displaced into its second position in a retainer cavity 58. When a lowered contour location 66 registers with a change ball 56 in its second position in its respective retainer cavity, the driver 20 in the corresponding pin chamber 18 will span across the shear line 38 of the lock 10, and the plug 16 cannot rotate. By staggering two high contour locations 66 on the key, as shown with the subset of keys in Figs. 22A-22N, it is always assured that, for any key that is used with the exception of the operable key, a lowered contour location 66 will associate or register with a pin chamber 18 that has its change ball 56 displaced to the retainer cavity 58. This can be seen more particularly with reference to Figs. 20A and 21A. In Fig. 20A, a second key 62a ~~first key 30a~~ which is operable is inserted into the lock 10. This second key 62a ~~first key 30a~~ has raised first and fifth contour locations 68, 76. The change balls 56 corresponding to those first and fifth contour locations 68, 76 have been displaced into corresponding retainer cavities 58. No driver or tumbler member in the pin chambers 18 spans the shear line 38 of the lock 10. This second key 62a ~~first key 30a~~ can operate ~~operate~~ the lock by rotating the plug 16 within the housing. In Fig. 21A, the second key 62a ~~first key 30a~~ has been removed and a first key 30a ~~second key 62a~~ is inserted. First key 30a ~~Second key 62a~~ has at least one lowered contour location 66 corresponding to a pin chamber 18 having a change ball 56 that has been displaced into a retainer cavity 58. In particular, the fifth contour location 76 is lowered, and registers with the fifth pin chamber 27 where the change ball 56 has been displaced into its corresponding retainer cavity 58. The first key 30a ~~second key 62a~~ cannot raise the driver 20 and tumbler 22 in the fifth pin chamber 27 high enough, causing that driver 20 to span the shear line 38. As such, the first key 30a ~~second key 62a~~ cannot operate the reconfigured lock 10 shown in Fig. 21A and 21B.

Please replace paragraph [0173] with the following amended paragraph:

[0173] In yet another alternative of the second embodiment, the subset of operable keys can be configured so that the individual user keys raise different numbers of the change balls above the shear line of the lock upon insertion into the keyway and rotation of the plug. In this alternative

embodiment, each key in the subset must be configured to avoid allowing any one key from having all of the raised contour positions of any other key in the subset, since having such would enable the former key to change automatically the configuration of the lock that is operated by the latter key without requiring use of the change tool. Using a subset of keys that can raise different number of change balls typically limits the total number of keys in the subset of keys requiring a change tool. For example, a six-chamber lock with a subset of keys that can raise some combination of two change members, three change members, or four change members, is typically limited to less than 10 ~~possible combination~~ possible combinations. By comparison, a six-chamber lock with a subset of keys that only have two raised contour positions to move two change members, or only have four raised contour positions to move four change members, has 15 possible combinations, and a six-chamber lock with a subset of keys that only moves three change members has 10 possible combinations.

Please replace paragraph [0174] with the following amended paragraph:

[0174] To lock out all user keys of the subset from operating the lock 10, an operator may have a "lockout" key having all contour locations 66 raised (~~not shown~~) (shown as key 86 in Fig. 13D) or at least having each contour location 66 raised where any one of the subset of user keys has a raised contour. Use of the lockout key (which can also be termed a programming or configuration key) would raise any remaining change balls 56 above the shear line 38 upon insertion into the keyway, regardless of which user key could previously operate the lock. By simply rotating this lockout key one-quarter turn clockwise (in the illustrated embodiment), such that the retainer cavities 58 come into alignment with the driver chambers 40 of the housing, any and all change balls 56 are forced by spring 26 from the driver chambers 40 down into the retainer cavities 58. This renders the lock 10 operable only for the "lockout" key. If an operator tried to use any other user key of the subset, the lowered contour locations 66 would not raise one or more of the drivers 20 sufficiently high enough, causing that driver 20 to span the shear line 38.

Please replace paragraph [0191] with the following amended paragraph:

[0191] Referring to FIGS. 1 and 37, in order to change the lock 10, the change tool 64 is provided for insertion into the longitudinal change slot 88. The change tool 64, suitably configured for use with the lock 10 as described, has a handle portion 136 and a blade portion 138. The blade portion 138 has a beveled edge end 141 to facilitate movement of the blade portion 138 past the retainer cavities ~~ties~~ 58 during insertion. As described above, with this change tool 64, the driver mechanism of the lock 10 can be readily changed to facilitate operation of the lock 10 with a different second key 62a. The blade portion 138 has a linear edge 143 that is configured to raise each change ball 56 out of its respective retainer cavity 58 when fully inserted into the change slot 88. The change tool 64 can also include a change tool notch 140 that is adapted to insert into a change tool notch groove 142 that can be disposed circumferentially in the housing 12 (see FIG. 11A). The notch 140 can register with the groove 142 to prevent the change tool 64 from being withdrawn and removed from the ~~change slot 64~~ change slot 88 unless the retainer cavities 58 or the tumbler chambers 42 are aligned with the driver chambers 40.

Please replace paragraph [0228] with the following amended paragraph:

[0228] The padlock of the present invention comprises a changeable lock assembly configured to rotate in both the first direction (generally clockwise, facing the keyway) and the second direction. FIGS. 44A, 44B, and 44C show an end view of the plug of the padlock in its initial position, and when rotated in both the first and second directions. Rotation of the plug in the first direction, from a first position shown in FIG. 44A to a second unlock position shown in FIG. 44C, can unlock the padlock. As with conventional padlocks, the lock is typically configured with a spring or biasing means to return the rotated plug back to the initial "key insertion" position. Rotation of the plug in the second direction (generally, counterclockwise), from the first position shown in FIG. 44A to a reprogramming position shown in FIG. 44B, can provide for reprogramming of the lock in accordance with the invention described hereinabove. Preferably, the rotation of the plug in the second direction will not unlock the padlock. To avoid unlocking the padlock when the plug is rotated in the second direction, the latch-rotating end 15 of the plug is provided with a tailpiece or latch 216 comprising a shaft 218 extending from a generally rounded base 217. The base 217 is rotatably retained to the latch end 15 with a

threaded nut 220 that ~~provides the base 217~~. The base 217 has a forward face 222 and a reverse face 224 defined by an opened wedge portion 219 (typically of about one-quarter to one-third of the circumference). ~~The stop pin 220~~ A stop pin 226 that extends from the latch end 15 can restrict rotation of the latch 216 within the span of the opened portion 219 between the forward face 222 and the reverse face 224.

Please replace paragraph [0229] with the following amended paragraph:

[0229] When the key is operated in the lock, the clockwise rotation of the key in the plug turns the plug and forces the stop pin 220 against the forward face 222 of the latch 216, which drives the latch to rotate in the clockwise direction, ~~as shown in FIG. 44C~~ (counter-clockwise when viewed from the rear of the plug, as shown in Fig. 44C). The rotation of the latch disengages the bolt(s) from the grooves in the shackle and unlocks the padlock. A spring or other biasing means (not shown) returns the latch, the plug, and the inserted key back to the initial position.

Please replace paragraph [0230] with the following amended paragraph:

[0230] The latch 216 of a typical padlock is configured to prevent its rotation in the counterclockwise direction. When the key rotates the plug counterclockwise to the second rotating or programming position, ~~as shown in FIG. 44B~~ (clockwise when viewed from the rear of the plug, as shown in Fig. 44B), the stop pin 220 is free to move within the opened portion 219 of the restrained latch 216. This arrangement is conventionally called a "lazy cam", where the cam or tailpiece is configured to remain stationary while the cylinder plug is partially rotated.